

**In the United States Court of Federal Claims**

No. 05-187 C

(Filed October 28, 2008)

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IVAN G. RICE, \*

Plaintiff, \*

v. \*

THE UNITED STATES, \*

Defendant. \*

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**CLAIM CONSTRUCTION ORDER**

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In this patent case, the First Amended Complaint filed by plaintiff, Ivan G. Rice, asserts that the Department of the Navy caused the unauthorized use and/or manufacture by or for the United States of one or more Intercooled Recuperated Gas Turbine Engine Systems (“ICR System”) covered by claim 1 of U.S. Patent No. B1 4,896,499 (‘499 patent) issued on an invention by Mr. Rice for a “Compression Intercooled Gas Turbine Combined Cycle.” Compensation is sought from the United States pursuant to 28 U.S.C. § 1498(a).

As provided in the applicable Scheduling Order, the parties filed a Joint Claim Construction Statement and a series of briefs addressed to claim construction. A Markman hearing on claim construction issues was held and Supplemental Claim Construction Briefs were filed.

Where the parties express agreement as to the meaning of claim terms in the Joint Claim Construction Statement or in the briefs, the agreed meaning is accepted for further proceedings in this case. For the disputed terms in claim 1 of the ‘499 patent, the constructions which are to apply for further proceedings are set forth below.

Claim 1 of the ‘499 patent, with the disputed terms underlined, reads as follows:

1. In a power producing system comprising a twin spool gas generator and a power turbine, said gas generator having a low pressure compressor driven by a low pressure turbine, a high pressure compressor

driven by a high pressure turbine, a combustor positioned between said high pressure compressor and said high pressure turbine, said power turbine positioned downstream from said low pressure turbine, the improvement being characterized in that:

said high and low pressure turbines being axially positioned and independently rotatable for driving said high and low pressure compressors, respectively, by means of concentric coaxial outer and inner shafting, respectively,

said gas generator including at least one externally mounted intercooler positioned between said low pressure compressor and said high pressure compressor, at least one compressor outlet duct from said low pressure compressor communicating with said intercooler, and at least one return duct from said intercooler communicating with said high pressure compressor,

wherein said compressor outlet and return ducts and connections between said compressors and said intercooler are provided between said axially positioned low and high pressure compressors for air flow to and from said intercooler in counterflow with coolant,

said outlet duct being configured to radially expand said air flow to a low velocity and

said return duct being configured for low radial flow return velocity to said high pressure compressor,

the high pressure compressor having an inlet flow area directly proportional to the outlet flow area of the low pressure compressor, and inversely proportional to the absolute temperature ratio between the high temperature air flow discharged from the low pressure compressor compared to the low temperature air flow from the intercooler passing to the inlet area of the high pressure compressor.

The initial disputed phrase is “externally mounted intercooler.” The parties’ proposed constructions are as follows:

Plaintiff's Construction	Defendant's Construction
An intercooler that is mounted outside the casing of the low pressure compressor and the casing of the high pressure compressor, excluding an intercooler that is mounted in the axial flow path of either compressor.	An intercooler that is mounted separately from and outside of the gas generator casing (the casing containing among other things, both the low pressure compressor and the high pressure compressor). The claimed intercooler cannot be an annular intercooler.

Generally, claim terms are given their ordinary and customary meanings, according to the customary understanding of a person of ordinary skill in the art who reads them in the context of the intrinsic record at the effective filing date of the patent application. *Phillips v. AWH Corp.*, 415 F.3d 1303, 1313 (Fed. Cir. 2005) (*en banc*). The patent specification is the single best guide to the meaning of a disputed term. *Vitronics Corp. v. Conceptronic, Inc.*, 90 F.3d 1576, 1582 (Fed. Cir. 1996). However, care must be taken not to cross a sometimes fine line between reading a claim in light of the specification, and reading a limitation into the claim from the specification. *Comark Commc'ns, Inc. v. Harris Corp.*, 156 F.3d 1182, 1186 (Fed. Cir. 1998). Prosecution history, comprising the record of proceedings before the Patent and Trademark Office ("PTO"), is consulted, particularly to exclude any interpretation that was unequivocally disclaimed during prosecution. *Chimie v. PPG Indus., Inc.*, 402 F.3d 1371, 1384 (Fed. Cir. 2005). The construction of the same claim terms and phrases of the '499 patent by the magistrate judge in *Rice v. Honeywell International, Inc.*, No. Civ. A. 6:05CVC330, 2006 WL 3420247 (E.D. Tex. Nov. 21, 2006) may appropriately be consulted. *Finisar Corp. v. DirecTV Group, Inc.*, 523 F.3d 1323, 1329 (Fed. Cir. 2008), petition for cert. filed (Oct. 2, 2008) (No. 08-445).

The parties agree that claim 1 places the intercooler "between" the low pressure compressor and the high pressure compressor. "Between" means "in or through the space that separates (two things)." *See Elekta Instrument S.A. v. O.U.R. Scientific Int'l, Inc.*, 214 F.3d 1302, 1307 (Fed. Cir. 2000). The dispute arises over the construction of "externally mounted." Plaintiff argues for a construction placing the intercooler external to the two compressors. Defendant argues for greater externality in the construction by placing the intercooler external to the gas generator which incorporates the two compressors as components.

Plaintiff points to the claim language “said gas generator including at least one externally mounted intercooler” as indicating the intercooler is part of the gas generator and not external to it. Figure 2 of the specification discloses that each compressor has a outer surface or casing and the intercooler is connected to ducts 36 and 42. The intercooler is thus depicted as being mounted external to the compressor casings. No gas generator casing associated with the compressors is depicted.

Defendant supports its proposed construction by citing the specification language, “[a]ccordingly, it is an object of this invention to provide an intercooled gas generator of a higher than normal cycle pressure ratio of 35 to 65 atmospheres, preferably about 50, with a coaxial shafting arrangement and an integral modular unit for easy installation and removal with respect to the intercooler(s), gas-generator exit diffuser, reheat combustor and power turbine.” (App. to Def.’s Cl. Constr. Br., DA 10, Col. 4, lns. 31-37.) Defendant asserts this language describes the intercooler as physically separate from the “integral modular” gas generator. Also cited is specification language describing the air flow through duct 36 to the intercoolers which then reads, “[t]he cooled air is returned to gas generator 20 by return air line 42 which is connected to said gas generator by flange connection 278 one on each side of said gas generator 20.” (*Id.* at DA 16 Col. 15, lns. 1-5.) By stating that cooled air returns to the gas generator, defendant argues the specification indicates that the intercooler is located outside the gas generator.

The language “at least one externally mounted” together with “said outlet duct being configured to radially expand said air flow to a low velocity and said return duct being configured for low radial flow return velocity to said high pressure compressor” was added to the specification in response to the patent examiner’s action mail, dated April 11, 1989. (Pl.’s Opn’g Cl. Constr. Br., Ex. D, 3.) This action mail had rejected the claim which eventually became claim 1 of the ‘499 patent as anticipated by prior art references. The action mail stated, “[b]oth references disclose concentric, multi-spool gas turbines with intercoolers between high and low pressure compressor stages . . . .” (*Id.* at Ex. C, 3.) The two prior art references are: Patent No. 3,273,340, issued September 20, 1966 to T. N. Hull, Jr., for a Gas Turbine Powerplant Having an Extremely High Pressure Ratio Cycle (“Hull”); Patent No. 3,486,340, issued December 30, 1969 to Anthony A. DuPont, Edward N. Harris, Thomas T. Schroeter for a Gas Turbine Powerplant With Means for Cooling Compressed Air (“DuPont”). (*Id.* at Exs. G-H.)

The prior art reflected by Hull and DuPont does not disclose an intercooler located so as to receive low velocity air flow and to deliver low velocity air flow to a high pressure compressor. The language added by the inventor in response to the examiner's rejection disclaimed the structural arrangement in Hull and partially that in DuPont, wherein the intercooler is mounted in the axial flow path of the compressor resulting in high air velocity and significant pressure loss.

After careful consideration of the parties' submissions, the construction advocated by plaintiff is adopted for further proceedings in this matter. Defendant's proposed added limitation of, "[t]he claimed intercooler cannot be an annular intercooler," is not included. The language adopted serves to reflect the annular distinction as found in the Hull and DuPont arrangements, but the prosecution history cited by the parties does not contain a clear and unmistakable disclaimer of all annular intercoolers. *See Computer Docking Station Corp. v. Dell, Inc.*, 519 F.3d 1366, 1374 (Fed. Cir. 2008); *Cohesive Techs., Inc. v. Waters Corp.*, \_\_\_ F.3d \_\_\_, 2008 WL 4472884, at \*5 (Fed. Cir., Oct. 7, 2008).<sup>1/</sup>

Externality of the intercooler(s) is limited to the casings of the two compressors in the absence of any specification reference to an associated gas generator casing, and in view of the specification depiction indicating that the intercooler is mounted outside the low and high pressure compressors. This construction was also adopted by the magistrate judge in *Rice v. Honeywell International, Inc.*, 2006 WL 3420247, at \*5 (E.D. Tex., Nov. 21, 2006).

The second disputed phrase is, "said outlet duct being configured to radially expand said air flow to a low velocity." The parties set forth their initial proposed constructions in the Joint Claim Construction Statement, filed April 22, 2008. Following briefing and oral argument, supplemental submissions, filed August 22 and September 4, 2008, have included proposed modified constructions. The parties' latest proposed constructions of the language at issue are as follows:

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<sup>1/</sup> In the Supplemental Brief, filed August 22, 2008, plaintiff argues that the accused WR-21 System does not have an "annular" intercooler so that defendant's proposed exclusionary language is irrelevant. *See Jang v. Boston Scientific Corp.*, 532 F.3d 1330, 1336 (Fed. Cir. 2008). Resolving this issue is deferred to further stages of this proceeding.

Plaintiff's Construction	Defendant's Construction
The outlet duct being shaped to cause air flowing away from and generally perpendicular to the axis of the shafting to increase in volume resulting in a decreased air flow velocity, with the air flow entering the intercooler at a velocity of less than approximately 200 feet per second.	The outlet duct being shaped to increase the cross sectional flow area in a direction generally away from and generally perpendicular to the axis of the gas generator, causing air flowing away from and generally perpendicular to the axis of the shafting to increase in volume resulting in a decreased air flow velocity to have a velocity of less than approximately 200 feet per second.

The main debate over the original proposed claim constructions was whether to include defendant's language "velocity of less than approximately 200 feet per second." (Jt. Cl. Constr. Stmt 2.) Both current proposals include this language. The parties agree to the construction of "radially" as "away from and generally perpendicular to the axis of the shafting." The parties now differ over defendant's proposed additional language "to increase the cross-sectional flow area in a direction generally away from and generally perpendicular to the axis of the gas generator." Defendant recognized in its Claim Construction Brief, p. 18, that "expansion of the air flow would always result in a 'decreased' velocity." Thus, if a duct is shaped to cause air to increase in volume, the flow velocity will be decreased. Defendant's additional proposed language as to the method of increasing volume was not raised as an issue initially and appears likely not to involve an issue in this litigation. Accordingly, at this stage in the litigation the additional language is not included in the construction, but the matter can be reconsidered if any relevance surfaces in further proceedings.

Accordingly, plaintiff's current proposed construction is adopted for further proceedings in this matter.<sup>2/</sup>

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<sup>2/</sup> For comparison, the magistrate judge in *Rice v. Honeywell International, Inc.*, 2006 WL 3420247, at \*8, construed "the disputed term 'said outlet duct being configured to radially expand said air flow to a low velocity' to mean 'said outlet duct shaped and positioned to cause air flowing away from the axis of the shafting to increase in volume resulting in a decreased air flow velocity.'"

The third disputed claim term is “said return duct being configured for low radial flow return velocity to said high pressure compressor.” By their Stipulation, filed August 22, 2008, the parties have agreed to a construction which is adopted for further proceedings in this matter. The stipulated adopted construction is, “[t]he return duct being shaped to cause the air that is flowing from the intercooler toward the high pressure compressor and generally perpendicular to the axis of the gas generator to have a velocity of less than approximately 200 feet per second.”

The forth disputed term “connections” appears in the claim 1 phrase “wherein said compressor outlet and return ducts and connections between said compressors and said intercooler are provided between said axially positioned low and high pressure compressors for air flow to and from said intercooler in counterflow with coolant.” (emphasis added). The parties’ proposed constructions are as follows:

Plaintiff’s Construction	Defendant’s Construction
Any structures (such as flanges) that connect the outlet and return ducts to the intercooler and permit air flow to and from the intercooler.	Piping and the associated flanges which deliver air from the compressor outlet duct to the externally mounted intercooler and from the externally mounted intercooler to the compressor return duct.

Claim 1 refers to “outlet and return ducts and connections.” This illustrates that connections are distinct from ducts. The parties agree that the term connection includes “flanges” which are referenced in the specification. Defendant proposes adding “piping” to the construction. In this regard, defendant cites Mr. Rice’s communication to the patent examiner, distinguishing the Hull prior art reference, stating that, “Hull uses annular ducting and intercooler and not separate piping to an externally mounted intercooler.” (App. to Def.’s Cl. Constr. Br., 23 at DA 67.) It appears from the context of the language that “piping” and “ducts” have essentially the same meaning when applied to the facilities conveying the air flow from the low pressure compressor to the intercooler and from the intercooler to the high pressure compressor. The American Heritage Dictionary of the English Language (3d ed. 1996) definitions of duct (“An often enclosed passage or channel for conveying a substance, especially a liquid or gas”) and pipe (“A hollow cylinder or tube used to conduct a liquid, gas, or finely divided solid”) are essentially the same in this context. Since claim 1 expressly sets forth “connections” as separate from “ducts” and

“piping” has the same meaning as “ducts,” “connections” must also differ from “piping.” Accordingly, defendant’s proposed construction is not supported, but plaintiff’s proposed construction is supported by the text of claim 1 and the specification. Plaintiff’s construction is adopted for further proceedings.

The fifth and final disputed claim term involves the claim 1 phrase “the high pressure compressor having an inlet flow area directly proportional to the outlet flow area of the low pressure compressor, and inversely proportional to the absolute temperature ratio between the high temperature airflow discharged from the low pressure compressor compared to the low temperature air flow from the intercooler passing to the inlet area of the high pressure compressor.”

The parties’ proposed constructions are as follows:

Plaintiff’s Construction	Defendant’s Construction
<p>The ratio of the low pressure compressor outlet flow area (<math>A_{LPC}</math>) and the high pressure compressor inlet flow area (<math>A_{HPC}</math>) matches the absolute temperature ratio between the high temperature for air flow that the low pressure compressor is capable of discharging (<math>T_{LPC}</math>) and the low temperature of air flow for air flow that the intercooler is capable of providing to the high pressure compressor (<math>T_{HPC}</math>), where the matching relationship can also be represented mathematically as <math>T_{LPC} / T_{HPC} = A_{LPC} / A_{HPC}</math></p>	<p>This phrase is a design rule applied to optimize the cross-sectional area of the air flow inlet of the high pressure compressor (HPC) in relation to the cross-sectional area of the air flow outlet of the low pressure compressor (LPC) for a single, particular predetermined operating condition (the design point) of the intercooler (1) by having the areas increase or decrease together on a constant ratio basis between them and (2) by having the cross-sectional area of the air flow inlet of the high pressure compressor also increase or decrease inversely to the ratio of the absolute temperature of the air flow at the cross-sectional area of the air flow outlet of the low pressure compressor divided by the absolute temperature of the air flow at the cross-sectional area of the air flow inlet of the high pressure compressor (i.e., the area increases as the ratio gets smaller and decreases as the ratio gets larger) such that the expression <math>T_{LPC} / T_{HPC} = A_{LPC} / A_{HPC}</math> is satisfied. The claim does not cover an apparatus in which the low pressure compressor and high pressure compressor matching relationship is achieved by way of changing a compressor speed or by changing the velocity of the air flow through the compressors.</p>



This disputed language was added to claim 1 during the reexamination prosecution of the '499 patent to distinguish the claimed invention from the prior art. (Pl.'s Cl. Constr. Br., Ex. E.)

Defendant's proposed construction minus its last sentence, comprises essentially the construction of the same claim language set forth in the Magistrate Judge's Memorandum Opinion and Order in *Rice v. Honeywell International, Inc.*, 2006 WL 3420247, at \*9-\*11 (E.D. Tex., Nov. 21, 2006). Proceedings in the instant case were suspended, pending completion of this district court litigation in the anticipation that the result in the district court, and any appeal, could well assist in the resolution of the instant litigation and avoid duplicative proceedings to the extent feasible. However, as noted by counsel, the final result reached in the cited Texas suit was appealed to the Federal Circuit and the litigation was then settled prior to a final appellate resolution. Plaintiff had a full opportunity to litigate this claim construction issue in this district court proceeding. The district court's docket indicates that the magistrate judge, in addition, had the assistance of an expert, retained at the parties' expense, with respect to determining his resolution of the claim construction issues. Absent the appeal of the district court's judgment and ensuing settlement, plaintiff might well have been estopped from contesting the issue in this court. *See Blonder-Tongue Labs., Inc. v. Univ. of Ill. Found.*, 402 U.S. 313, 333 (1971).

As noted previously, even if not binding, it is appropriate to consult the magistrate judge's construction of the language in claim 1 of the '499 patent and this is particularly appropriate where a party, as here, proposes that the district court's construction essentially now be adopted in this litigation.

The disputed claim language is significant as the examiner relied upon it in the reexamination prosecution to sustain patentability. In the Notice of Intent to Issue Reexamination Certificate, dated July 15, 1992, the examiner stated (Pl.'s Cl. Constr. Br., Ex. F.):

As stated in the paper granting the Request for Reexamination, the pertinent new material supplied by Requester consists of the publication to Quandt and the publication to Bowen and Ness. After making a complete evaluation of these references, it has been concluded that they may have been applicable to original claims 1-6 of requester/owner's '499 Patent but are not applicable to amended claims 1-6 and new claims 9-16 submitted March 9, 1992. In addition to the limitations set

forth in the original claims, the present claims all set forth a specific relationship between the inlet flow area of the high pressure compressor, the outlet flow area of the low pressure compressor, and the air temperature ratio across the intercooler. The publications cited with the Request for Reexamination do not disclose such a feature. (emphasis added).

Both parties agree with the construction explaining the matching relationships represented mathematically by  $T_{LPC} / T_{HPC} = A_{LPC} / A_{HPC}$ . The parties differ as to whether this relationship is applied to obtain low and high pressure compressor structures optimized for a predetermined intercooler operating condition. The magistrate judge, in reliance on the specification, construed the relationship to mean “[a] design rule applied to optimize the cross-sectional area of the air flow inlet of the high pressure compressor in relation to the cross-sectional area of the air flow outlet of the low pressure compressor for a predetermined operating condition of the intercooler . . . .” 2006 WL 3420247 at \*11. This construction is supported by the specification portions the magistrate judge cites.

Plaintiff discounts the magistrate judge’s claim construction by asserting that it is inapplicable in that the accused engine in the district court suit was a later revision of the WR-21 engine involved in the instant case. (Pl.’s Cl. Constr. Br. 17.) However, claim construction does not focus on the accused device, it addresses the language of the patent claim at issue. *Phillips*, 415 F.3d at 1313; *SRI Int’l v. Matsushita Elec. Corp. Of Am.*, 775 F.2d 1107, 1118 (Fed. Cir. 1985) (*en banc*). Here the same patent claim language is at issue.

Accordingly, after an independent review of the constructions and supporting material submitted by the parties concerning the claim language at issue, it is concluded that the construction set forth by the magistrate judge is correct. His analysis is supported by the intrinsic evidence cited which includes the same evidence submitted by the parties in the instant case. Thus, for further proceedings the meaning of the claim language is as follows:

[A] design rule applied to optimize the cross-sectional area of the air flow inlet of the high pressure compressor in relation to the cross-sectional area of the air flow outlet of the low pressure compressor for a predetermined operating condition of the intercooler (1) by having the areas increase or decrease together on a constant ratio basis between them and (2) by having the cross-sectional area of the air flow inlet of

the high pressure compressor also increase or decrease in opposite to the ratio of the absolute temperature of the air flow at the cross-sectional area of the air flow outlet of the low pressure divided by the absolute temperature of the air flow at the cross-sectional area of the air flow inlet of the high pressure compressor (i.e., the area increases as the ratio gets smaller and decreases as the ratio gets larger), which can be expressed mathematically as:  $[T_{LPC} / T_{HPC} = A_{LPC} / A_{HPC}]$

Defendant, in addition, asserts that Mr. Rice disclaimed any apparatus in which the matching relationship ( $T_{LPC} / T_{HPC} = A_{LPC} / A_{HPC}$ ) is achieved by way of changing a compressor speed or by changing the velocity of the air flow through the compressors. In the reexamination prosecution, Mr. Rice's statement did include this text (Pl.'s Cl. Constr. Br., Ex. E at 14, 15):

While the advantages of this particular matching relationship are discussed in the specification at Col. 9, the Examiner should appreciate that various other factors could theoretically be changed to satisfy Boyles Law. For example, the speed of both the high and low pressure compressors could be modified, although according to the present invention, a change in the speed is not used to obtain the desired substantial matching to satisfy Boyles Law. Also, the velocity of the air flow could be changed, for example by utilizing variable stator blades, to satisfy Boyles Law, although according to the teaching of the present invention such a velocity change is not utilized to achieve the substantial matching of the air flow between the low and high pressure compressors. Such substantial matching of the low and high pressure compressors is uniquely obtained by satisfying the area and temperature relationships recited in the amended claims. Adjustments of this match may take into consideration minor changes, such as the 3% pressure drop referenced at Col. 9, line 43, or slight rotational speed or stator blade modifications. Such adjustments are not excluded by the present invention, provided the area and temperature relationships are satisfied to achieve the substantial low pressure compressor and high pressure compressor matching which is claimed. Requester submits that there is no teaching or suggestion in the newly cited references, nor in any of the references previously considered by the Examiner, that the low and high pressure compressors should be matched as a function of the relationship set forth in amended Claims 1 and 3.

The issue raised is whether this language constitutes an unequivocal disclaimer of achieving the matching relationship by changing compressor speed or air flow velocity. *Chimie v. PPG Inds.*, 402 F.3d at 1384. Because Mr. Rice in his statement made room for “minor changes” in the adjustments, it is concluded that the language does not reach the unequivocal level. Defendant’s proposed disclaimer language is not included in the construction adopted for further proceedings.

Finally, the possibility is reserved for reconsideration of any of the above constructions if information gained from further proceedings would so indicate.

s/ James F. Merow

James F. Merow  
Senior Judge